

Dear Sirs:

It is with great concern that I write these comments regarding docket number 04-37, the NPRM for broadband over power line technology, more commonly known as BPL.

The HF spectrum (by this I mean frequencies from 3 to 30 MHz) is a valuable resource. Government agencies, emergency services, military, amateur radio, and others depend upon HF communications on both a daily basis and especially at times of emergency for worldwide communications. HF is unique in that it affords this type of communication using the properties of the ionosphere and therefore does not require infrastructure beyond the Earth, the Sun, and the interactions between them. In times of emergency, as can be seen by examining the tragic events of September 11th, 2001 or any similarly large event, manmade infrastructure often does not survive the emergency and we are left to find other modes of communication. The HF spectrum is often the only alternative for long range communication.

BPL technology, as it is currently implemented in the HF and low VHF spectrum, has the potential to either render the HF spectrum useless or to raise the noise floor to the point where weak signals are no longer able to be heard. This could reduce the effectiveness of HF as an emergency communications medium to the point where it is no longer an effective tool for worldwide communications. While the goal of ubiquitous broadband access to the internet is a laudable one, I think that providing that access at the expense of long range HF communications is a tradeoff where we gain something that we could get by other means while we render an extremely valuable resource unusable. Please understand that I am not opposed to what BPL is trying to accomplish as far as expanding access to the internet. What I am opposed to is doing that at the expense of practical HF communications especially when alternatives using the microwave spectrum are viable.

In the next few paragraphs I will outline some of my technical concerns about BPL and about the current rules governing BPL deployment.

Transmission Lines:

BPL, as the name implies, is transmitted over electrical transmission lines using existing above ground and below ground medium voltage transmission lines. There are several modulation schemes but most of these technologies use frequencies in the HF to low VHF spectrum as they are not severely attenuated when carried on these electrical transmission lines. These signals are not transmitted in a balanced way (the currents are not differential on the line and, as such, are not cancelled) and thus time varying electric and magnetic fields develop. These fields create the same conditions for radiation that an antenna structure does, albeit potentially inefficiently. Some transmission lines will probably be very efficient at certain frequencies and may make ideal antennas at points in the HF spectrum. This will lead to unintentional radiation which could affect licensed services.

Propagation:

At this point in time we are heading toward the bottom of the solar activity cycle. Propagation of HF signals is somewhat attenuated when compared with the peak of the solar cycle. This peak will occur roughly near 2007. At the solar activity peak, propagation of HF signals will be greatly enhanced at higher and higher frequencies. It is not uncommon during the peak to have very efficient propagation of signals into the low VHF region. These signals can propagate great distances even when the transmitted power is very low (less than 1 watt). A significant concern for the author is that, while we may get one view of BPL interference at this point in time, the picture may look very different in a few years when the solar cycle peaks. BPL interference may be much worse in 2007 and it will be too late at that point for the FCC to reevaluate its position.

Noise Floor:

The noise floor is a cumulative measure of noise energy at a given frequency. This

noise can come from many sources both manmade and natural. A concern with BPL, especially when looked at in light of what was said about propagation in the last paragraph, is that it will cumulatively contribute to raising the noise floor of the HF bands and thus overwhelm very weak signals and render them useless. A pernicious problem with raising the noise floor is that it can be all but impossible to pinpoint the source of the noise as it is mixed with all other noise sources creating a cacophony of radio noise. In this situation doing interference mitigation is anywhere from difficult to impossible since it is nearly impossible to identify one interfering device amongst the many interfering devices. When propagation is extremely efficient this situation gets much worse. BPL noise sources from hundreds or thousands of miles away could contribute via multiple paths through the ionosphere. Tracking the source of such signals could easily be impossible.

Interference Mitigation:

Including technology for interference mitigation is a step in the right direction for BPL but I fear that this mitigation technology will be inadequate to deal with real world problems. My concern is twofold. The first concern is that automatic mitigation will only respond when a signal is detected by the BPL system. This transmitted signal will have to be of significant amplitude in order to be detected by the system and thus would have to be local to the system. Unfortunately this does not solve the problem in the case where one is attempting to scan a range of frequencies to receive weak signals or when transmitting with very low power. In the case of automatic mitigation it is also unclear how and when the notched frequencies would return to BPL use without immediately causing interference again. The second concern is that when BPL carrier frequencies are moved to other parts of the spectrum, users of that part of the spectrum will experience an unexpected increase in noise and will then have to have that part of the spectrum notched. If enough notches become necessary then the spectral energy in the remaining parts of the HF band will likely increase and thus certain parts of the HF band may experience increased interference energy as other interference is mitigated. This is less of a concern than the first issue but is worth noting. In addition to the above, manual or automatic mitigation simply moves the problem to another part of the spectrum. Perhaps it would be better to allocate a portion of the HF spectrum specifically to BPL technologies. Mobile stations also present issues that are not easily dealt with by automatic or manual mitigation technology.

Part 15:

Unfortunately, FCC part 15 rules only provide for restrictions on the amount of radiated energy of an unlicensed device as measured by field strength at a given distance. This does not take into account the noise floor nor does it take into account propagation. Under these rules a part 15 device may be within the limits imposed by the rules but still radiate significantly and cause interference to licensed users of the spectrum. This can be, for example, a result of a low noise floor or efficient propagation of signals even at the low levels specified in part 15. Devices under part 15 are also expected to handle interference from licensed spectrum users. Licensed users of the spectrum have recourse with the FCC when an interference problem occurs, however, I am concerned that matters of interference both from and to BPL by licensed users, particularly amateur radio operators who form a significant part of this country's volunteer emergency communications capability, might not be resolved in favor of the licensed user. There is past precedence in the "quiet hours" imposed on amateur radio operators who have had interference problems with non-compliant part 15 devices. If broadband internet access is interrupted significantly by amateur radio operators while operating in their licensed part of the spectrum, will "quiet hours" become a permanent part of most amateur radio operation? Only the FCC can answer this question but it is a significant concern for those who are amateur radio operators.

As an engineer with 25 years experience, I find myself facing grave concerns regarding this technology. It seems a difficult, if not impossible, task to deploy BPL technology as I understand it and avoid radio interference in the HF spectrum. If we cannot deploy BPL without interference to the HF spectrum we will be rendering useless an extraordinarily valuable natural worldwide communication mode. One which can work

without infrastructure and which can be used to communicate with very low power and very simple equipment. The loss of this resource could seem almost invisible to most until the next time disaster strikes. Then, I believe, we will regret having disabled this important part of our world. Thank you for your time.

Respectfully submitted,

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